

Notice of Allowability

Application No.

10/688,281

Examiner

A. Dexter Tugbang

Applicant(s)

YUN ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the application filed on October 17, 2003.
2. ☒ The allowed claim(s) is/are 16-20.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☒ Certified copies of the priority documents have been received in Application No. 09/444,128.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date 10/17/03
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date attached herein.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Raffaele DeMarco on March 17, 2006.

The application has been amended as follows:

In the Specification

On page 1 of the specification, the paragraph after the title has been replaced with the following.

--This is a Divisional application of 09/444,128, filed on November 19, 1999, now U.S. Patent 6,662,418. Each of these prior applications is hereby incorporated herein by reference, in its entirety.--.

On page 32 of the specification, the abstract has been replaced with the following.

A manufacturing method for a ceramic device using a mixture with a photosensitive resin includes: providing a ceramic substrate, forming a lower electrode on the substrate using a mixture of a photosensitive resin and metal, masking and exposing the lower electrode to pattern the lower electrode, forming a piezoelectric/electrostrictive layer on the lower electrode using a mixture of photosensitive resin and piezoelectric/electrostrictive ceramic, masking and exposing the piezoelectric/electrostrictive layer to pattern the piezoelectric/electrostrictive layer, forming

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an upper electrode on the piezoelectric/electrostrictive layer using the mixture of photosensitive resin and metal, and exposing the upper electrode to pattern the upper electrode.

In the Claims

Claims 16-20 have been amended as follows.

16. (Amended) A method for manufacturing a ceramic device using a mixture with photosensitive resin comprising the steps of:

providing a ceramic substrate;

forming a lower electrode on said substrate using a mixture of photosensitive resin and metal;

masking and exposing said lower electrode to pattern [it.] said lower electrode;

forming a piezoelectric/electrostrictive layer on said lower electrode using a mixture of photosensitive resin and piezoelectric/electrostrictive ceramic;

masking and exposing said piezoelectric/electrostrictive layer to pattern [it] said piezoelectric/electrostrictive layer;

forming an upper electrode on said piezoelectric/electrostrictive layer using [a] the mixture of photosensitive resin and metal; and

exposing said upper electrode to pattern [it] said upper electrode.

17. (Amended) The method in Claim 16, further comprising the step of thermally treating the [produced] ceramic device at 500-1200°C.

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18. (Amended) The method in Claim 16, wherein said ceramic is selected [among] from the group consisting of aluminum oxide, zirconium oxide, silicon, silicon carbide, silicon nitride, silicon dioxide and glass.

19. (Amended) The method in Claim 16, wherein said mixture of photosensitive resin and piezoelectric/electrostrictive ceramic is one of a ceramic sol solution containing a photosensitive complexing agent, a mixture of ultraviolet ray hardening resin and ceramic powder, a mixture of said mixture of ultraviolet ray hardening resin and ceramic powder[and a ceramic sol solution of same or similar composition with said ceramic powder], or a mixture prepared by additional mixing of an organic solvent for controlling [the] a material property into said mixture of ultraviolet ray hardening resin and ceramic powder[and a ceramic sol solution of same or similar composition with said ceramic powder].

20. (Amended) The method of Claim 16, wherein said photosensitive resin to form [a] the mixture with the metal is a conductive UV adhesive or a transformed material of organic compound making a chelate with said metal.

Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance.

The prior art does not teach all of the limitations of the claimed invention including: masking and exposing a lower electrode to pattern the lower electrode, forming a piezoelectric/electrostrictive layer on the lower electrode using a mixture of photosensitive resin and piezoelectric/electrostrictive ceramic, then masking and exposing the piezoelectric/electrostrictive layer to pattern the piezoelectric/electrostrictive layer, forming an

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upper electrode on the piezoelectric/electrostrictive layer using the mixture of photosensitive resin and metal, and exposing said upper electrode to pattern the said upper electrode.

The references to Zdeblick et al and Hashizume each disclose methods of forming piezoelectric devices.

Zdeblick teaches forming a lower electrode layer (e.g. 36, 38, 40), forming a piezoelectric/electrostrictive layer (e.g. 42 in Fig. 4) on the lower electrode layer, forming an upper electrode layer (e.g. 44) on the piezoelectric/electrostrictive layer. However, the upper electrode of Zdeblick is not formed of a mixture of a photosensitive resin and metal.

Furthermore, Zdeblick does not teach separate steps of masking and exposing the lower electrode layer and then masking and exposing the piezoelectric/electrostrictive layer.

Hashizume shows forming a lower electrode layer (e.g. LE) on a substrate, forming a piezoelectric/electrostrictive layer (e.g. PEZ), forming an upper electrode layer (e.g. TE), and masking and exposing the upper electrode layer and the piezoelectric/electrostrictive layer (see sequence of Figs. 9 and 10). However, Hashizume does not teach masking and exposing the lower electrode layer and that the lower electrode layer is formed of a mixture of a photosensitive resin and metal. Furthermore, Hashizume does not teach separate steps of masking and exposing the piezoelectric/electrostrictive layer and then exposing the upper electrode layer.

It would not be obvious to one of ordinary skill in the art to modify each of the references above to add any of the missing features because to do so would add unnecessary process steps that would simply destroy the structure of each of Zdeblick and Hashizume.

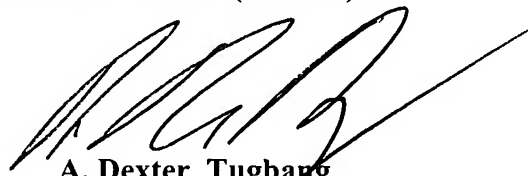
Accordingly, Claims 16-20 are allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to A. Dexter Tugbang whose telephone number is 571-272-4570. The examiner can normally be reached on Monday - Friday 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Vo can be reached on 571-272-4690. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



A. Dexter Tugbang
Primary Examiner
Art Unit 3729

March 17, 2006